

Massachusetts Department of Environmental Protection
Bureau of Water Resources – Wastewater Management Program
Combined Sewer Overflow Final Public Notification Plan

1. Facility Information

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



Name of Permittee (Facility or System)

Permittee Contact Name

Email Address

Phone number

Permittee Mailing Address

NPDES Permit #

System contains (check all that apply):

- Collection system Pump station(s) above 1MGD Wastewater treatment plant

Location of WWTP discharge, if applicable: _____

Attach a map with locations of discharges and affected waterbodies. Include other supporting information as needed.

2. Identification of Environmental Justice Populations

Are there Environmental Justice (EJ) populations that would potentially be affected by your wastewater treatment plant discharge(s) or a combined sewer overflow? See the Instructions file for more detail. Yes No

If there are EJ populations that would potentially be affected, do 25% or more of households lack English-language proficiency, and at least 5% of the population self-identify as “do not speak English very well”? See the Instructions file for more detail. Yes No

Provide a list of all languages that notifications will be translated into:

Attach a description of how translations of public advisory notification and signage required by these regulations will be provided to EJ populations in the languages listed above. Include:

- A description of the third party or internal resource used to produce the translations
 A description of how the translation will be accessed by a public advisory notification recipient
 A description of how the translation will be accessed by someone reading the signage at CSO outfalls and public access points

3. Discharges, Overflows, and Public Notification Content

When public notification is required: (check box to affirm)

Permittee is aware that all events covered under 314 CMR 16.03(1)(a-e) require a public notification.

Required content of public notification: (check box to affirm)

Permittee is aware of all required information for public notifications under 314 CMR 16.04(10)

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Attach a description of how the permittee will meet the requirements under 314 CMR 16.04(10), including the following:

- How the permittee will determine or discover that an event has occurred
- How the permittee will estimate the volume of discharges or overflows
- How the permittee will estimate the commencement times, cessation times, and duration of discharges or overflows
- A list of the waters and land areas affected by the permittee's discharges or overflows

Permittee can meet all requirements of 314 CMR 16.04(10) Yes No

If no, please describe in detail which components the permittee is not able to meet and the measures needed to comply. Include a schedule for compliance.

Components that cannot be met

Schedule for compliance

4. Discovery and Required Timeline for Notification Following Discharge or Overflow

Requesting approval of an alternative method:

Is the permittee requesting approval to use a method other than metering to detect a discharge? (Requires approval of MassDEP Commissioner) Yes No

- If yes, **attach** additional information on the method to detect a discharge
- If yes, **attach** a letter to the Commissioner with the approval request

Discovery of a Discharge or Overflow:

Attach a description of the steps the permittee will take to determine or discover that a discharge or overflow from its outfall or sewer system is occurring

Can the permittee discover an event under 314 CMR 16.04(5)(a), (b) & (c) within the required timeline? Yes No

- If no, **attach** a description specifying the limitations to meeting these requirements and potential remedies. Include and a schedule for implementing potential remedies.

Issuance of Public Notification:

Permittee can meet the notification requirements in 314 CMR 16.04(4) to notify as soon as possible, but no later than two hours after discovery. Yes No

- If no, **attach** a description specifying the limitations, potential remedies, and a schedule for implementing potential remedies.
- If no, **attach** a letter to the Commissioner requesting approval for a longer time period for notification.

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Continuation of Public Notification:

Permittee can meet the notification requirements in 314 CMR 16.04(7) to issue an update 8 hours after the public advisory notification, if the initial notification does not indicate that the event has ceased. Yes No

If no, **attach** a description of which requirement cannot be met, what measures are needed for compliance, and a schedule for compliance.

Cessation of Public Notification:

Permittee can meet the notification requirements in 314 CMR 16.04(8) to continue issuing 8 hour updates for ongoing events, and notify within 2 hours of when the event ceases or is projected to cease. Yes No

If no, **attach** a description of which requirement cannot be met, what measures are needed for compliance, and a schedule for compliance.

Retraction of Public Notification:

Permittee can meet the notification requirements in 314 CMR 16.04(9) to issue a retraction if the permittee becomes aware within 48 hours of issuing the public advisory notification that no discharge or overflow actually occurred. Yes No

If no, **attach** a description of which requirement cannot be met, what measures are needed for compliance, and a schedule for compliance.

5. CSO Permittee Website

Does the permittee/sewer authority have an existing website or web page where relevant information is posted? Yes No

If yes, provide the URL:

Describe the subscriber-based system where the public can sign up to receive your notifications.

Permittee's website is able to meet the requirements under 314 CMR 16.04(3) Yes No

Permittee's website is able to meet the requirements under 314 CMR 16.05(1)(a-e) Yes No

If any website requirements can not be met, specify limitations to meeting these requirements, potential remedies, and a schedule for compliance:

Attach a description of how the Permittee will update the website with requirements under 314 CMR 16.04(3) and 314 CMR 16.05(1)(a-e)

6. Signage

Permittee has consulted with the Board of Health/Health Departments in municipalities affected by their discharges for public access sign location points as required by 314 CMR 16.05(3)? Yes No

Attach a list of locations where signs will be installed and dates when signs will be installed.

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Permittee is able to meet the signage requirements under 314 CMR 16.05(2)? Yes No

If no, specify limitations to meeting these requirements, potential remedies, and a schedule for compliance:

Permittee is able to meet the signage requirements under 314 CMR 16.05(3)? Yes No

If no, specify limitations to meeting these requirements, potential remedies, and a schedule for compliance:

7. Public Notification Recipients

Media Outlets

List the two media outlets serving the area near the discharge or outfall that the permittee will contact to provide a public notification. Include name of organization, name of contact, and contact's email address or fax number.

Name of media outlet #1

Name of media outlet #2

If permittee has determined that an EJ population could potentially be affected by a discharge or overflow, which of these media outlets serves the EJ population? If neither does, then provide at least one additional news organization that primarily serves the EJ population(s) within the impacted municipalities. (Include name of organization, name of contact, and contact's email address or fax number.)

Name of additional media outlet serving EJ population if neither media outlet above serves EJ population

Attach a description explaining how the identified media outlets serve potentially affected EJ populations.

See Instructions for list of **Required Public Notification Recipients** (314 CMR 16.04(4)(a)).

Attach a list of your required contacts.

8. Detection method maintenance

If metering is used, will the Permittee perform the requirements in 314 CMR 16.06(2)(b) below?

Calibrate metering equipment on an annual basis, at minimum Yes No

Properly maintain metering equipment Yes No

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If models are used and approved, will the Permittee perform the following requirements in 314 CMR 16.06(2)(d) below?

- | | | |
|---------------------------------------------------------------------------------------------------|------------------------------|-----------------------------|
| Review and update the model input data as needed | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Maintain any data collection equipment providing critical input to the model | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Assess model predictions annually, at a minimum | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Provide a description of actions taken in writing on or before March 1 st of each year | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
-

9. Public Notice

Submit a public notice to the Environmental Monitor at the same time this plan is submitted to MassDEP. Indicate below that the permittee will submit the public notice as follows:

- Email the public notice to MEPA@mass.gov at the same time the plan is submitted to MassDEP
 - Include in the body of the email, "Please publish the attached public notice as 'Notice of Combined Sewer Overflow (CSO) Final Public Notification Plan.'"
 - Attach the public notice to the email as a PDF
- Permittee will place a public notice in at least one media outlet that serves the EJ population(s) in the municipalities impacted by the discharge. Indicate media outlet(s) below:
-

Include the following in the Public Notice, required under 314 CMR 16.06(2):

- A statement that a CSO Public Notification Plan has been prepared and submitted to the Department
 - A link to a website where an interested party can review the plan
 - A statement that written comments on the plan can be submitted to MassDEP and the permittee for a period of 30 days after the date of publication in the Environmental Monitor or media outlet, whichever date is later. Explicitly list the end date for submission of public comments
 - Translations of the Public Notice in languages most appropriate for neighborhoods within the impacted municipalities that are identified as environmental justice populations due to lacking English language proficiency
-

Certification

I attest that I have examined and am familiar with the information contained in this submittal, including any and all documents accompanying this certifying statement. The information contained in this submittal is, to the best of my knowledge, true, accurate, and complete. I am fully authorized to make this attestation on behalf of the facility.

Print Name

Title

Signature

Date



March 31, 2023

Lowell Preliminary Public Notification Plan

Executive Summary

The City of Lowell (Lowell) has developed this Public Notification Plan pursuant to the requirements stated in Massachusetts Regulation 314 CMR 16. As a city that historically contained a Combined Sewer infrastructure, Lowell has made concerted efforts over the years to mitigate and control Combined Sewer Overflows (CSOs) and continues to do so as investments are made in its wastewater and stormwater infrastructure. This Plan outlines public notification protocols which will comply with the regulatory requirements.

Lowell is collaborating with various stakeholders on the Merrimack including: downstream municipalities, regional organizations, Boards of Health, and other wastewater utilities. Lowell's plan was created to meet the requirements of the CMR while ensuring consistent messaging from and to all parties on the Merrimack. Lowell has also engaged with an engineering consultant to support the draft submission in May 2022, the final submission due in January 2023, and the updated submission due in March 2023.

Section 1: Permittee and System Information

Lowell Wastewater's sewer system consists of approximately 220 miles of gravity sewers and 14 sewage pumping stations. Ten miles of large-diameter (48-inch to 120-inch) interceptors located along the banks of the Merrimack and Concord Rivers collect wastewater from the sewer system and convey it to the Wastewater Treatment Plant. The treatment plant was designed to provide biological treatment for an average flow of 32 million gallons per day (MGD), with a short-term peak full treatment capacity of 62 MGD.

Lowell Wastewater manages a Supervisory Control and Data Acquisition (SCADA) network, which allows operators to remotely monitor and control gates, valves, and pumps directly from the Operations Center at Duck Island. In addition to equipment at Duck Island, remote monitoring and control was enabled at nine active CSO diversion stations along the interceptor system that discharge into the Merrimack River, Concord River, and Beaver Brook (See Table 1 & Figure 1).

Table 1: Permitted Outfall Locations

| Outfall # | Name | Latitude | Longitude | Receiving Water |
|--------------|-------------------|----------|-----------|-----------------|
| 002-SDS#1 | Walker Station | 42.64621 | -71.33407 | Merrimack River |
| 007-SDS#2 | Beaver Brook | 42.65933 | -71.31925 | Beaver Brook |
| 008-SDS#3 | West Station | 42.65254 | -71.31032 | Merrimack River |
| 011-SDS#4 | Read Station | 42.64822 | -71.30111 | Merrimack River |
| 012-SDS#5 | First Street | 42.64756 | -71.29086 | Merrimack River |
| 020-SDS#6 | Warren Station | 42.64277 | -71.30502 | Concord River |
| 027-SDS#7 | Tilden Station | 42.65072 | -71.31152 | Merrimack River |
| 030(1)-SDS#8 | Barasford Station | 42.64531 | -71.28841 | Merrimack River |
| 030(2) | Merrimack Station | 42.64518 | -71.28881 | Merrimack River |

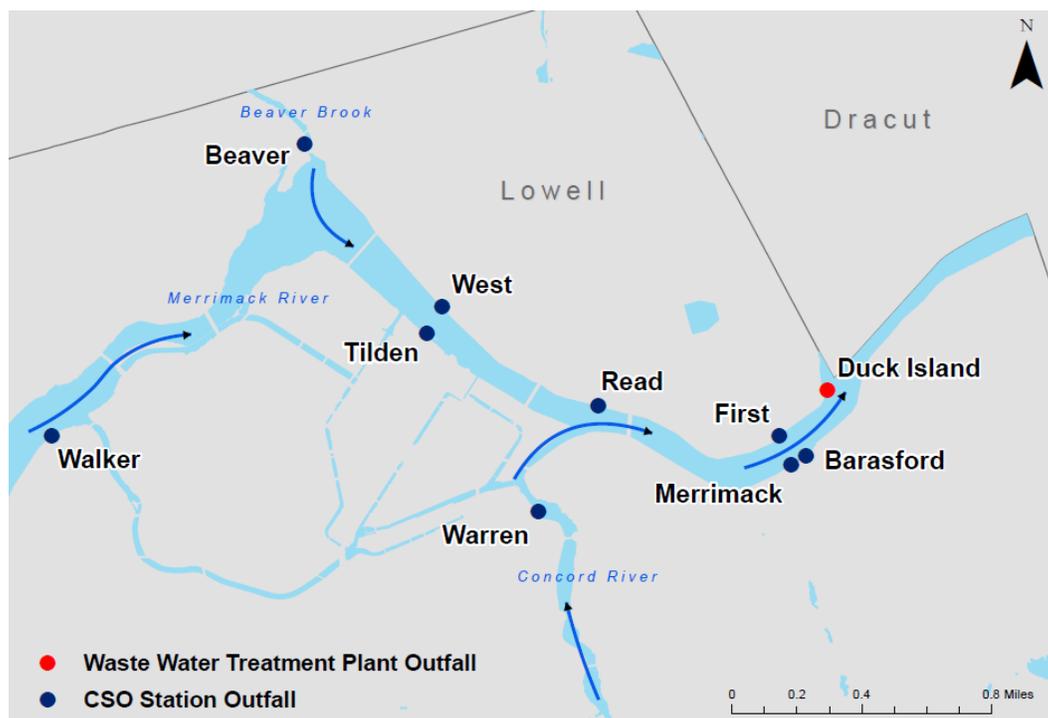


Figure 1: Lowell CSO Diversion Locations

Section 2: Identification of Environmental Justice Populations

Identification of Environmental Justice Populations

Lowell is engaged with a consultant to determine the affected area from a CSO discharge event. The affected area was determined by an analysis of river flow during wet weather, CSO discharge and pathogen concentrations. Historical flow and rainfall data were used to determine the typical river flow conditions during CSO activation to estimate the extent of downstream impact. The affected area for combined sewer overflows was determined to extend to approximately 12.3 miles beyond the Lowell Regional Wastewater Utility outfall to Wingate Avenue in Methuen, MA. This includes the following municipalities downstream of Lowell: Dracut, Tewksbury, Andover, Lawrence, and Methuen (Figure 2). Affected area for blended wastewater and SSO events was determined to be 591 feet and 222 feet beyond the outfall respectively. An explanation of the calculation of the affected area is included in Attachment A.

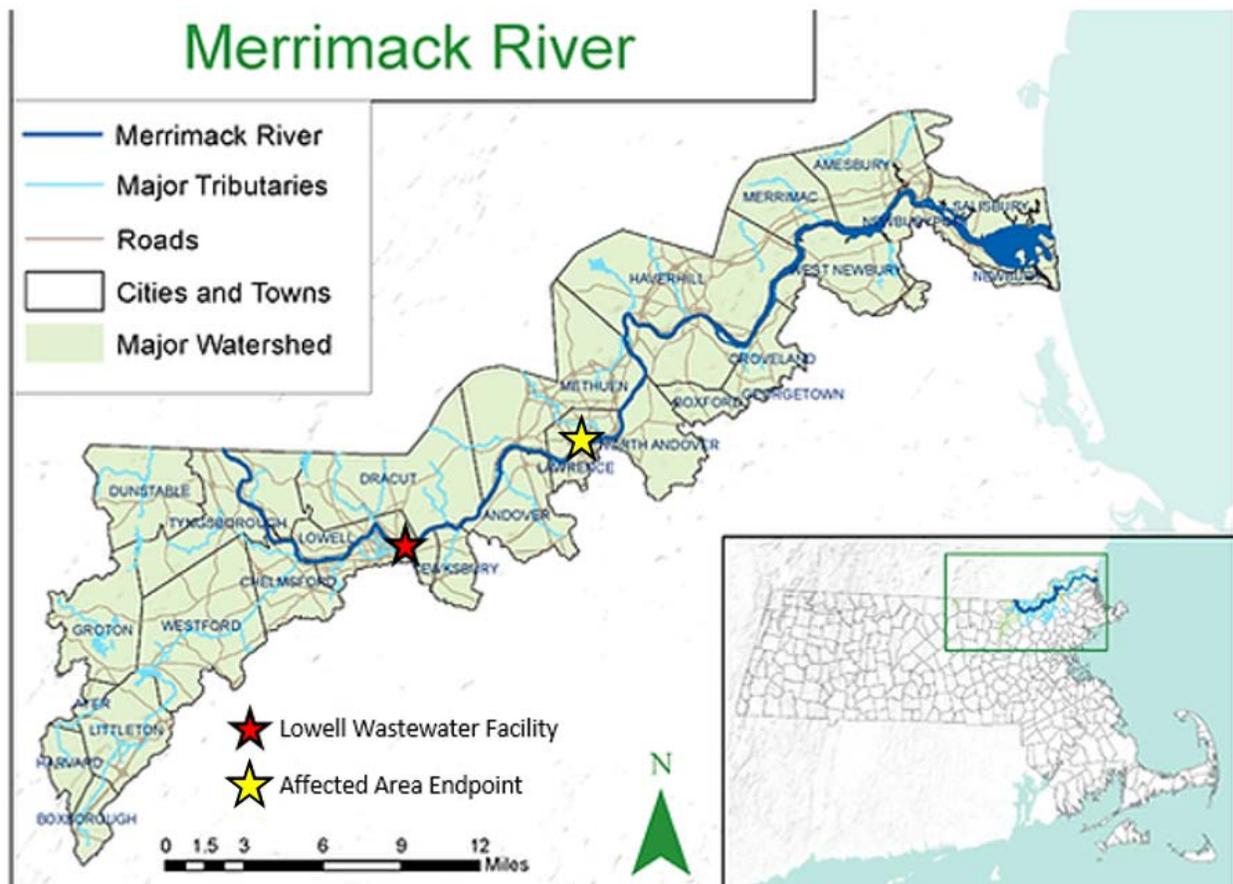


Figure 2: Communities on the Merrimack River (Source: Massachusetts River Alliance)

Downstream municipalities that have 25 percent or more households that lack English language proficiency were identified using the list of 2020 Environmental Justice populations from mass.gov. Municipalities that are designated as meeting the above threshold were denoted with an "E" on that list and include Lowell, Lawrence, and Methuen. Data from the 2015 census depicting languages spoken by 5% or more of the population that self-identify as "do not speak English very well" was provided through the Massachusetts Executive Office of Energy and Environment Affairs (EOEEA). Using the map shown in Figure 3, Lowell

identified the following languages meeting that criteria in the three identified communities: Spanish or Spanish Creole, Portuguese or Portuguese Creole, and MonKhmer/Cambodian

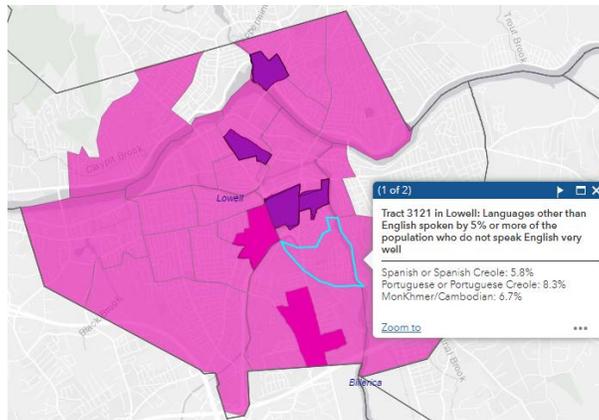


Figure 3: Languages identified in Lowell where 5% of the population has speakers who self-identify as “do not speak English well”

Required Translation: Public Advisory Notification Translation

Lowell will be distributing public notifications through a third party vendor. The vendor software allows for the public to choose their preferred language for public advisory notifications.

Required Translation: Signage Translation

Permanent signage posted will include a QR code which will link to Lowell’s website providing translations through Google Translate. The translation widget covers all three languages identified above, in addition to over 100 other languages. The Google Translate widget is located on the bottom right of the website, and works when viewing the website through a mobile device or desktop computer (Figure 4).

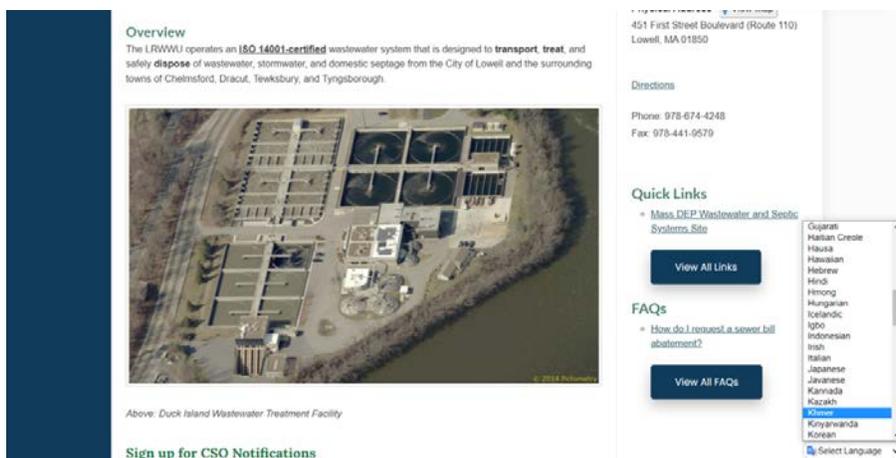


Figure 4: Lowell website translation through Google Translate

Required Translation: News organization that primarily serves the environmental justice population

The two largest news organizations in the area, the Boston Herald and Lowell Sun, do not serve the Environmental Justice populations stated above. Lowell has identified alternative news organizations that serve the Portuguese (Brazilian Times) and Spanish (El Planeta) population. These two new organizations will be included in the distribution list for notifications. As of now, a Cambodian news organization has not

been identified. As part of the “Frequently Asked Questions on 314 CMR 16.00” MassDEP stated they will share a list of alternative media outlets once complete. When an official news outlet for this Environmental Justice population is found, Lowell will update and add the Cambodian news outlet to the distribution list.

Section 3: Discharges, Overflows, and Public Notification

Lowell is aware of all requirements covered under 314 CMR 16.03(1)(a-e) that necessitate a public advisory notification, and of the required information to be included in the public notifications under 314 CMR 16.04(10). Lowell can meet all the requirements listed in 16.04(10).

The Lowell Wastewater Treatment Plant (Duck Island) is staffed year round 24-hours a day by both a Grade 6 Certified Head Operator and an operator, at a minimum. Lowell utilizes electronic instruments at all CSO stations for the direct measurement/metering of CSO information. The calculations are automated via Lowell’s SCADA system. Lowell’s SCADA system provides real-time alerts for discharges, which are continuously monitored by a Head Operator who confirms the overflow prior to initiating public notification. Lowell utilizes Hach Water Information Management Solution (Hach WIMS) as well as additional reporting technologies to aid in data validation of recent high flow events.

In addition to a 24-hour operation staff, the Collection System Supervisor is on call 24 hours a day with multiple employees designated as backups. When Lowell is notified of a possible sanitary sewer overflow (SSO), an employee visits the site to inspect the incident and determine if the overflow impacted a public waterway. If a public waterway is impacted, a public advisory notification will be issued.

Below is a list of all of the information that is required to be in the public advisory notification in accordance with 314 CMR 16.04 (10), followed by the Lowell’s plan to meet each of the regulations:

(a) Description of discharge or overflow location(s), and outfall number(s), if applicable

- Active discharge locations are determined using direct monitoring at the CSO stations and instantaneously communicated to the Head Operator on duty by a SCADA alarm. The public notification will include Table 1 with an additional column indicating if the station is active or inactive.
- Partially treated events are discharged through Duck Island’s permitted outfall, serial number 035.
- A description of all reportable SSOs will include the closest street address as well as name and location of any body of water that the SSO impacts.

(b) Approximate date and time the discharge or overflow began, and its duration

- Active discharge locations are determined using direct monitoring at each CSO station and instantaneously communicated to the Head Operator on duty by a SCADA alarm. See Figure 5 for an example of alarms for a diversion station. The SCADA system will timestamp when the “...Diversion in Progress” alarm begins and when the “...Diversion Ended” alarm triggers for each CSO station (See Figure 6). The SCADA system will then calculate the duration based on time between these alarms and display it for the Head Operators to record.

| BARASFORD ALARM SETUP | | | | | | |
|-----------------------------------|--------|------------------|---------|------------------|-------|----------|
| PLC Control In Remote | | | | | | |
| ALARM | STATUS | ENABLE / DISABLE | | ACTIVE / STANDBY | | SETPOINT |
| Communications Failure | NORMAL | | | | | |
| Influent Channel High level | NORMAL | ENABLE | DISABLE | Active | Stnby | 5.5 ft |
| Diversion Gate Out Of Position | NORMAL | ENABLE | DISABLE | Active | Stnby | 3.6 % |
| Flow Control Gate Out Of Position | NORMAL | ENABLE | DISABLE | Active | Stnby | 3.5 % |
| Flow Control Gate Closed | NORMAL | ENABLE | DISABLE | Active | Stnby | |
| Diversion Gate Not In Remote | NORMAL | ENABLE | DISABLE | Active | Stnby | |
| Flow Control Gate Not In Remote | NORMAL | ENABLE | DISABLE | Active | Stnby | |
| Gravity Diversion Pending | NORMAL | ENABLE | DISABLE | Active | Stnby | |
| Gravity Diversion In Progress | NORMAL | ENABLE | DISABLE | Active | Stnby | |
| Gravity Diversion Ended | NORMAL | ENABLE | DISABLE | Active | Stnby | 5 min |

Figure 5: Barasford Alarm Screen

The screenshot displays a SCADA interface with a tree view of CSOs and a table of recent diversion and bypass events.

North Bank CSO

- Read Street CSO: Control, Alarms
- West CSO: Control, Alarms
- Beaver Brook CSO: Control, Overview; Alarms 1, Alarms 2
- Walker CSO: Control, Alarms
- First CSO: Control, Alarms

South Bank CSO

- Merrimack CSO: Control, Overview; Alarms 1, Alarms 2
- Barasford CSO: Control, Alarms
- Warren CSO: Control, Alarms
- Tilden CSO: Control, Alarms

Other CSOs (Right Column):

- Appleton Mills: Control, Alarms
- Freda: Control, Alarms
- Trotting Park: Control, Alarms
- Cannington: Control, Alarms
- Varnum: Control, Alarms
- Pawtucket: Control, Alarms
- Princeton: Control, Alarms
- Rosemont: Control, Alarms
- Lawrence Mills: Control, Alarms
- Chelmsford: Control, Alarms
- Pyne: Control, Alarms
- Rivers Edge: Control, Alarms
- Hamilton Canal District: Control, Alarms

Recent Diversion

Start: 4 / 19 8:49
End: 4 / 19 8:50

Recent Bypass

Start: 4 / 19 4:7
End: 4 / 19 11:14

Figure 6: Diversion and Bypass Timestamps

- Partially treated status is determined via SCADA alarms as described in 16.04(10)(b) for CSO alarms.
- Lowell actively maintains six level sensors deployed at areas with reported reoccurring overflows. These level sensors measure and collect level profiles over user-specified time intervals across an established deployment period. In the event that an SSO occurs in one of the deployed areas these level sensors can be used to get an estimate of time, duration and volume of the SSO. Sensors are moved to additional areas when investigation is required. At the time of plan development the sensors are located in the marked areas in the following picture (Figure 7).

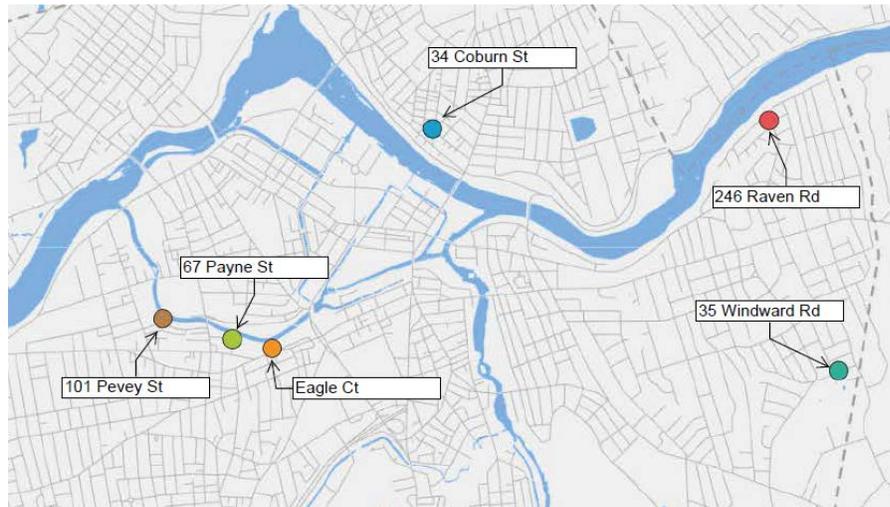


Figure 7: Collection system level sensor locations

- In the event that an SSO occurs where a level sensors is not deployed, notification of an SSO would rely on citizen or employee notification. This notification can occur via a phone call to the facility or through an online citizen reporting portal on the Lowell website. Lowell will follow up with a site visit to the location within 4 hours to confirm the event and determine the impact of the overflow. The employee responding to the event will notify the Head Operator on duty if a public advisory notification needs to be sent with the relevant information.
- (c) *Estimated volume of the discharge or overflow will be determined based on the average discharge or overflow from data reported to the Department and/or EPA for the prior three calendar years, taking into consideration historical information for the projected rainfall event, if possible.*
- Estimated volume of the discharge for each discharge is determined by taking the mean discharge volume for each discharge event that occurred in the three previous calendar years. See Attachment B for an example calculation.
- (d) *Identity of the permittee*
- Lowell Wastewater will identify itself by name and permit number, MA0100633, in all public notifications.
- (e) *Whether, at the time of notification, the discharge or overflow has ceased, and if so, the approximate time and date that the discharge or overflow ended*
- Lowell Wastewater continuously monitors all permitted CSO stations and outfalls through the SCADA network. A "...Diversion Ended" alarm will trigger for each CSO station when the gates have fully closed or the level is below the weir. The time of the event has ceased for each CSO station will be timestamped for the Head Operator to record on the public advisory notification. (Figure 6)
 - Partially treated status is determined via SCADA alarms as described in 16.04(10)(e) for CSO alarms.
 - SSO discharges cessation are determined using the best available resources. If a location has level sensors, that data is utilized to determine when the discharge ended. If no level sensor is present, employee investigation will be used.
- (f) *Waters and land areas, including names of water bodies and municipalities, affected or potentially affected by the discharge or overflow*
- All CSO outfalls discharge to either the Merrimack River, Concord River, or Beaver Brook. Affected area calculation determines that the discharge is affective to Wingate Avenue in Methuen, MA.
 - Table 1 will be included in the CSO discharge public advisory notifications which show water bodies that are impacted by the event.

(g) Precautionary measures to be taken by the public, including the following language: “Avoid contact with these water bodies for 48 hours after the discharge or overflow ceases due to increased health risks from bacteria and other pollutants. See website for more information on whether specific resource areas, such as bathing beaches, are affected.”

- All public notifications will include the required precautionary language noted in 16.04(10)(g).

(h) Link to the permittee's website for additional information on discharges and overflows, and its CSO and/or SSO abatement program(s)

- A link to Lowell Wastewater’s website will be provided as part of all notification emails.

(i) A statement that the discharge or overflow consists, or likely consists, of untreated or partially treated sewage and waste.

- A notification for partially treated events will be issued for all notifications from Outfall Serial Number 035. All other events, needing notification, will be considered untreated.

Section 4: Discovery and Required Timeline for Notification

Discovery and Notification of CSO Discharges

As mentioned in previous sections, an advanced SCADA network was established throughout Lowell's collection system, providing operating personnel at Duck Island with an active and continuous view of the flow and capacity within the system. Active flow and level depth monitoring is gathered through direct metering at Lowell's regulated CSO Stations. Programmed to follow Lowell's High Flow Management (HFM) Protocol logic, when the SCADA network detects insufficient available capacity based on set points within the collection system, automated commands to discharge at one or more of these relief points are performed, triggering an alarm notification in the process.

The CSO alarm notification serves as the official notice for the Head Operator to confirm that an active discharge is occurring within the collection system. Upon discovery, the Head Operator will send out a public notification within two hours. While the SCADA alarm serves as an accurate and reliable discovery method of a CSO discharge, in the event of any uncertainty regarding the legitimacy of a discharge alarm, the Head Operator will review station level and CSO measurement trends to verify the event prior to sending out CSO notification.

Within two hours of discovery of a CSO discharge, appropriate Lowell personnel shall issue a public advisory notification that meets the information specified within 314 CMR 16.04(10). Public advisory notifications shall be issued electronically to the appropriate entities specified within 314 CMR 16.04(4). In the event that CSO discharges occur at multiple CSO outfalls, Lowell will issue a combined public advisory notification.

Lowell is equipped to send out additional public notifications eight hours later. An alarm will trigger seven hours after the start of the event alerting the Head Operator to send an eight hour updated public advisory notification. The following information will be included:

- *Indication as to whether a discharge or overflow is ongoing or has ceased.*
 - Lowell will follow the same method described in Section 3 under the response for 314 CMR 16.04 (10)(b).
- *If it has ceased, indication of the approximate time of cessation*
 - Lowell will follow the same method described in Section 3 under the response for 314 CMR 16.04 (10)(b).
- *Any updated information that has changed since the initial public advisory notification.*
 - The Head Operator will note any corrections/errors in the notification.
- *Shall be issued to all parties required to receive notifications under 314 CMR 16.04(4).*
 - The public advisory notification will be sent to all required recipients and all members that are signed up for notifications.

Lowell is capable of updating the city website with information on high flow events by the end of the next business day after the event has ceased. Prior to posting to the website all volumes, durations, and start times are reviewed by the engineering team and thus Lowell does not have the staff on site to post to the website 24 hours a day. Permission to delay posting to website until next business day was noted in MassDEP documentation accompanying the 314 CMR 16.00 regulation. Lowell's business hours are 7 am to 3 pm, Monday through Friday.

Discovery and Notification of SSO Discharges or Overflows

Sanitary Sewer Overflows (SSOs) occur infrequently in Lowell's collection system, and are predominantly constrained to known problem areas. SSOs are typically discovered in one of two ways: through citizen reporting and level monitoring.

Citizens are able to notify the Utility and report observed issues by using the CivicReady electronic messaging system, hosted on Lowell Wastewater's website, and/or calling the Utility. Areas with known reoccurring SSOs are actively monitored via the deployment of a collection of six level sensors just upstream of the areas of concern. These level sensors measure and collect level profiles over user-specified time intervals across an established deployment period. Data collected from these sensors is transmitted to an online viewing portal. Text and email alerts are set such that an alert notification is sent out in real time when a level threshold is breached.

The alert notification will be relayed to an on-call staff, who will visit the area of concern to inspect the reported overflow. The staff member shall determine whether the overflow occurred based on the results of the inspection. Any confirmed SSO shall be considered "discovered" upon completion of this inspection.

In the event that an SSO discharge or overflow has been determined to flow into a surface water, the staff member onsite will relay the information to the Head Operator on duty. The Head Operator will send a notification with the relevant information specified by 314 CMR 16.03(1)(c) through (e). The public advisory notification shall be issued within four hours of discovery.

Discovery and Notification of Partially Treated Wastewater

During high flow events, Lowell maximizes flow through the facility through a secondary bypass. Lowell utilizes a SCADA network which notifies operators of increased flows and the need for secondary treatment bypass. The bypass gates open once the flow exceeds the bypass start set point, starting the bypass event. When flows reach this point, the Head Operator receives an alarm. The SCADA system controls the bypass gates to maximize flow. The bypass gates close once the flow can be fully treated ending the event. (See Figure 8). The times the bypass started and ended are timestamped on a SCADA screen (See Figure 4).

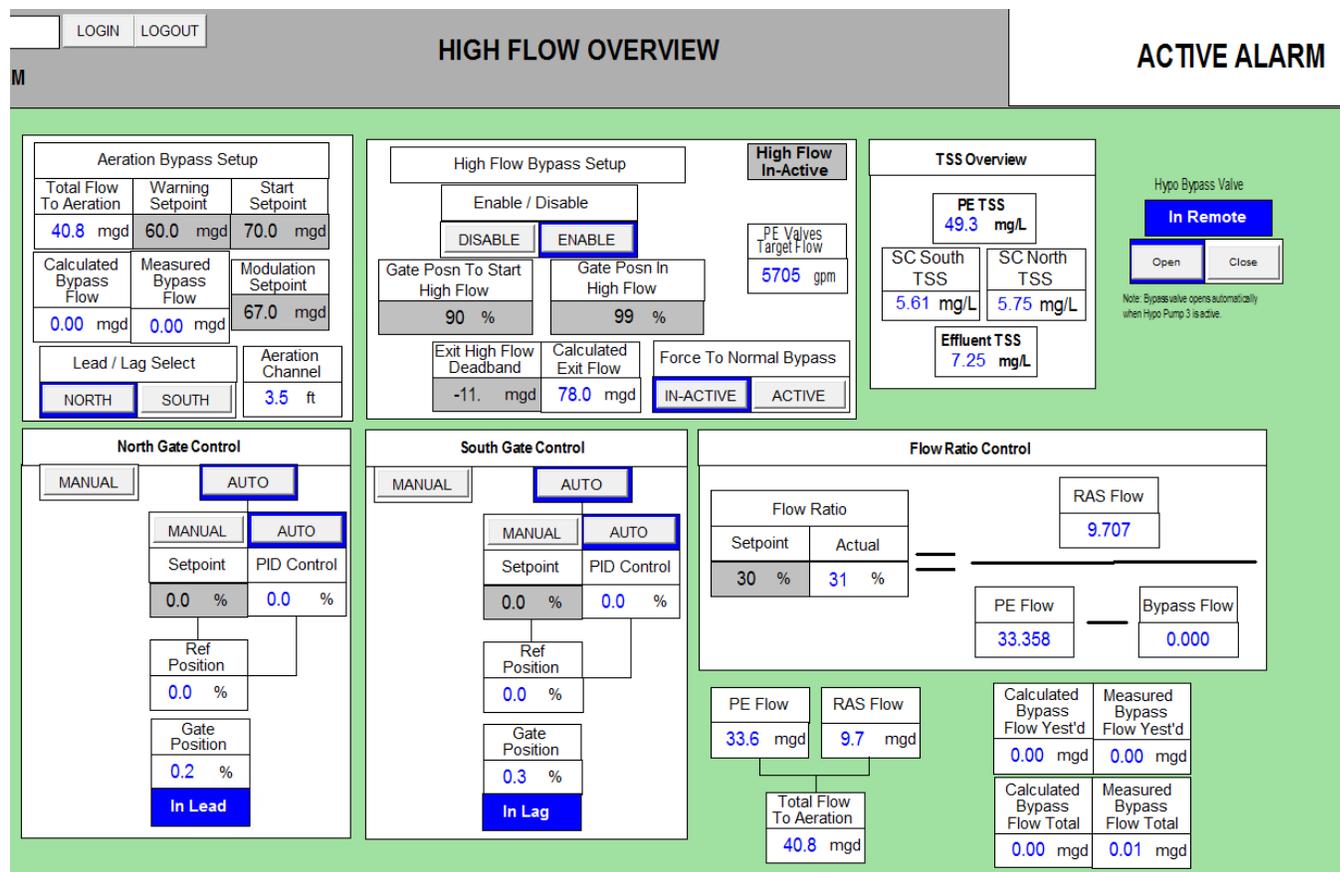


Figure 8: Lowell's High Flow Overview SCADA Screen

Lowell uses a combination of SCADA and Hach WIMS to determine and record the duration and volume of bypass; additional reporting technologies are used to initiate public notification within two hours.

See the "Discovery and Notification of CSO Discharges" in Section 4 for eight hour notification details.

Cessation of Public Notification

Once an event is complete, whether it be a CSO or partially treated event, the Head Operator is notified of the cessation of the event by SCADA alarms. After receiving an alarm that the discharge has ended, the Head Operator will verify the event has ceased. Approximate time that the discharge ceases is recorded in SCADA and can be reported in the eight hour public advisory notification.

Retraction of Public Notification

If at any time after the public notification is sent a staff member determines that the discharge did not occur, then a retraction email will be sent to the full distribution list. Operations staff utilize the SCADA system to determine active discharges by utilizing alarms and data trends. Lowell engineering staff will review the data from the most recent discharge to determine the validity of the data. This review process involves comparing data from multiple different flow meters, rain gages, and SCADA set points to determine if the discharge followed standard protocols and if the data aligns with what would be expected for that high flow event. In the event that previously reported discharge data is inaccurate a retraction notification will be issued.

Section 5:CSO Permittee Website

In accordance with 314 CMR 16.04(3) Lowell shall establish and maintain a public website to post public advisory notifications. Notifications will be uploaded to the website as discussed in Section 4. Along with the notifications, information on CSO and high flow treatment can be found on the Lowell's website. Records from past high flow treatment events, dating back three calendar years, can be found on the Lowell's website uploaded on a monthly basis. Lowell's website includes pages explaining the treatment process as well as high flow treatment procedures.

The website will include links to websites providing information on the closure or advisory status of shellfish growing areas, bathing beaches, or other water resource areas potentially affected by the discharge or overflow.

In accordance with 314 CMR 16.05(1) Lowell's High Flow management webpage will include the following pieces of information:

- (a) *A map showing Lowell's nine permitted CSO outfall locations as well as a table noting the corresponding outfall numbers*
 - Table 1 and Figure 1 are located on the website under the wastewater combined sewer overflow page (www.lowellma.gov/1287/Combined-Sewer-Overflows-CSO).
- (b) *A summary of the Lowell's Long-term CSO Control Plan, and status of its implementation*
 - Lowell will add a Long Term Control Plan to the website when it has been approved. The website will include a summary of the approved plan, with updates to this section of the website done on a yearly basis and/or when a major milestone occurs.
 - Once approved, the Long Term Control Plan can be found in the following location:
www.lowellma.gov/1076
- (c) *Instructions on how an interested person can subscribe to receive public advisory notifications*
 - Interested individuals may subscribe to Lowell's notification list by filling out a Notification Request on Lowell's website (www.lowellma.gov/1287/Combined-Sewer-Overflows-CSO). Users will be redirected to a webpage to provide their primary contact information which will then be automatically added to the distribution list for all notifications.
- (d) *Links to any CSO Reports required to be developed in a NPDES for at least the preceding three calendar years*
 - CSO Reports are included within Lowell's Annual Report which will be posted to the website.
- (e) *A compilation of discharge data for each public advisory notification event, updated so that data for each month is posted within 15 days of the last day of the month. Data posted shall include updated information on the estimated duration, frequency and volume of the discharge, rainfall data, and treatment provided for any CSO discharges. The website shall include data for at least the preceding three calendar years, if applicable.*
 - All data in 16.05(1)(e) will be uploaded to the website by the 15th day of the month.
 - Lowell Wastewater utilizes a SCADA system and Hach WIMS program to collect and analyze data on high flow, as well as other aspects of the treatment process. Reported discharges are reviewed prior to publishing to the website.

Section 6: Signage

In accordance with 314 CMR 16.05 (2), each CSO station and outfall will have at minimum one sign on or outside the station and one sign visible from the river or waterway in the vicinity of the CSO outfall. Signs will state the name of the station, the SDS number, and identify it as a diversion station and outfall for Lowell. These signs will be in English, but will also include universal symbols that express no fishing, boating, or swimming in the vicinity of the outfall. (Figure 9)

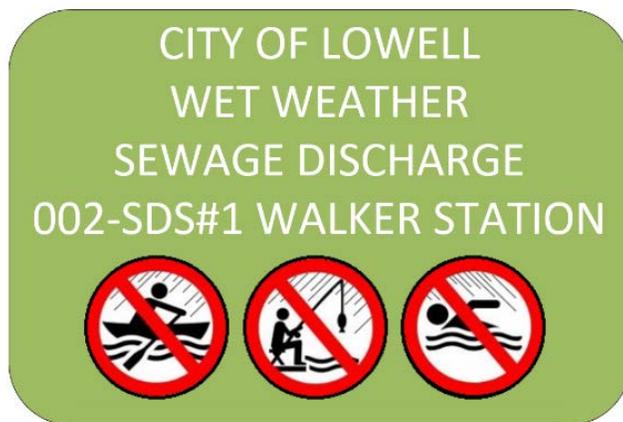


Figure 9: Outfall Sign for Walker Station

To accommodate regulation 314 CMR 16.05 (3), Lowell developed a sign utilizing MassDEP's template. The sign states that the location is downstream of a combined sewer outfall, and includes warning text and explains the dangers to the waterway during high flow events, as well as universal pictograms. A QR code and a URL are included to link to the Lowell's website for additional information and translations. Signs include a section that allows the Boards of Health to post temporary notices. Below is an example of the template design for the public access point sign (Figure 10).

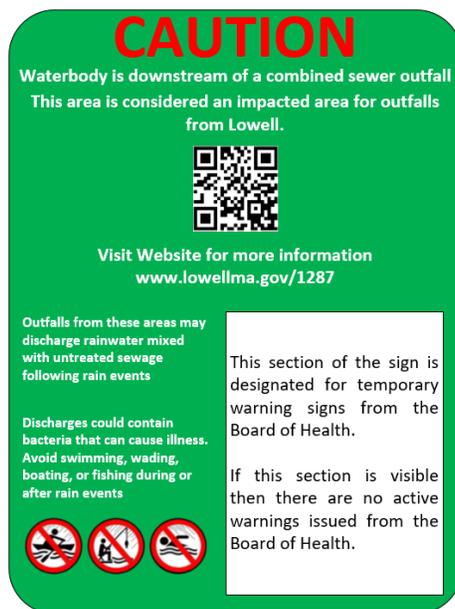


Figure 10: Sign template for public access points

Once the plan and sign are approved, Lowell will ensure the signs are deployed to all required locations within three months of approval. Lowell will work with downstream communities on the deployment of signs not within the city of Lowell.

Lowell used the MassDEP CSOs and Beach/Boat Access map provided on their website as a base list in the determination of public access points within the affected area. Lowell contacted municipalities and boards of health members in all downstream communities within the affected area to confirm contact information and public access points. Table 2 depicts locations along the Merrimack River within the affected area.

Table 2: Public Access Locations

| Municipality | Access Type | Access Name/Address | BOH Contact |
|---------------------|--------------------|-------------------------------------------------------------|-----------------------------------------------|
| Lowell | None | No Public Access Points | Lisa Golden lgolden@lowellma.gov |
| Dracut | None | No Public Access Points | Dave Ouellete douellette@dracutma.gov |
| Tewksbury | None | No Public Access Points | Shannon Gillis sgillis@tewksbury-ma.gov |
| Methuen | Fishing & Boating | Riverside Conservation Area 1110 Riverside Drive | Felix Zemel fzemel@ci.methuen.ma.us |
| Andover | Public Access | 53 River Road (Behind Greater Lawrence Technical School) | Thomas Carbone Thomas.Carbone@andoverma.us |
| Lawrence | Fishing & Boating | Riley Park 57 Wolcott Avenue | Michael Armano MArmano@cityoflawrence.com |

Section 7: Public Notification Recipients

In accordance with 314 CMR 16.04 the public advisory notification, and any updates required by 314 CMR 16.04(7) and (8), shall also be issued to at least the two largest news organizations which are The Lowell Sun and the Boston Herald for Lowell. Lowell will also serve the Environmental Justice populations through the news organizations mentioned in Section 2.

Lowell's public advisory notification, and any required updated notifications shall be issued electronically to the parties listed below. Additional recipients will be added to the distribution list upon request. All addresses noted below are based on active contact information at the time of publishing and are subject to change.

- Massachusetts Department of Environmental Protection; massdep.sewagenotification@mass.gov
- the U.S. Environmental Protection Agency; R1.EPANotifications@epa.gov; koopman.douglas@epa.gov
- the Massachusetts Department of Public Health; DPHToxicology@mass.gov
- the municipal board of health or the health department where the outfall or overflow is located; Lisa Golden, the director of Health and Human Services for the City of Lowell
- the board of health or the health department and shellfish constables (if applicable) for any municipality directly impacted by the discharge or overflow;
 - Lowell has reached out to all Boards of Health downstream of Lowell to update the contact list. All boards of health contacts, noted in Table 2, that have public access points along the Merrimack River, will be included in the distribution list.
- any person who subscribed to receive such public advisory notifications by email or text messaging;
 - Anyone from the public can be added to the distribution list via the Lowell Website: www.lowellma.gov/1287
- the public water supplier(s) where drinking water supplies may be affected;
 - Lowell has contact information for all drinking water suppliers that source their water from the Merrimack River and are downstream of Lowell. All drinking water facilities that fall within the affected area are included in the distribution list.
- the Massachusetts Division of Marine Fisheries where shellfish growing areas may be affected; jeff.kennedy@mass.gov
- the Massachusetts Department of Conservation and Recreation when its water recreation properties may be affected; MEMA.StateControl@mass.gov
- the Massachusetts Division of Fisheries and Wildlife when its boat ramps and fishing piers may be affected; doug.cameron@mass.gov
- Operators of any potentially affected bathing beaches, as defined in 105 CMR
 - There are no known bathing beach within the affected area of the Merrimack River.

Attachment A



MEMORANDUM

TO: Evan Walsh, Engineering Supervisor
City of Lowell

FROM: Peter Varga, Kleinfelder

DATE : 03/27/23

SUBJECT: Lowell Affected Area Calculation Methodology

CC: Aaron Fox, Gordon Bergeron
City of Lowell

BACKGROUND

The City of Lowell has submitted a Preliminary Public Notification Plan pursuant to the requirements stated in Massachusetts Law 314 CMR 16.06(1). As part of that Plan, the intent of this memorandum is to describe the methodology applied to calculating the affected area caused by Combined Sewer Overflow (CSO), treatment plant bypass, and Sanitary Sewer Overflow (SSO) discharges from the combined sewer system to the receiving water bodies, including the Merrimack River, the Concord River and Beaver Brook. The affected area can be defined as the downstream extent of contamination in pathogen concentrations still above the State water quality limit. The CSO Public Notification Plan for the City of Lowell requires that populations within any affected area downstream of a discharge be notified of the risks associated with the contaminant release into the receiving waters.

The Merrimack River is 117 miles long, has its headwaters in New Hampshire and flows southward into Massachusetts before traveling northeast, emptying into the Gulf of Maine at Newburyport, MA. Major communities that exist along the Merrimack River downstream of Lowell include Lawrence, Methuen, Haverhill, West Newbury, and Newburyport. For discharges to the Concord River and Beaver Brook, there are no downstream communities prior to the convergence of those water bodies to the Merrimack River. Using the methodology described below, estimates of affected area, particularly in reference to the communities along its length, can be made.

DATA COLLECTION

Grab Sampling. Grab sampling is used to characterize the pathogen concentration in the CSO discharge during overflow events, because of the short holding time requirement (6 hours) for pathogen samples. A grab sample is a discrete, individual sample collected over a maximum of 15 minutes. Grab samples represent the conditions at the time the sample is taken, and do not account for variations in quality throughout a storm event. Sampling is conducted using standard QA/QC protocols and procedures. Due to the large quantity of grab sample data from the

Massachusetts Water Resources Authority’s (MWRA) CSOs, and the similarities between the two sewer systems, MWRA data is used in this affected area calculation. As Lowell collects more data on its CSOs it will eventually replace MWRA’s data with its own to estimate concentrations in subsequent storm events. The table below summarizes Class B water statistical threshold values which is not to be exceeded by more than 10% of grab samples.

EPA bacteria standard for Class B Water – Statistical Threshold Value (STV)

| | | |
|-------------------------|-----|-----------|
| <i>E. Coli</i> STV | 410 | cfu/100mL |
| <i>Enterococcus</i> STV | 130 | cfu/100mL |

Precipitation. Rainfall data is necessary to analyze the Combined Sewer System (CSS), calibrate and validate CSO models, and develop design conditions for predicting current and future CSOs. Rainfall data includes long-term rainfall records and data gathered at specific sites near the CSS. To ensure that data collection efforts are representative and conservative, events are selected for the affected area determination that displayed the highest ratio of CSO discharge volume to rainfall quantities.

Streamflow. Several U.S. Geological Survey (USGS) gaging stations exist along the Merrimack River. For determining the flow in the Merrimack River during each storm event, CSO release, and discharge, applicable published USGS gaging station data is used. Specifically, stream gages that are located at Manchester, Lowell, and Newburyport are analyzed as part of the affected area calculations.



[Location map of the Massachusetts section of the Merrimack River | U.S. Geological Survey \(usgs.gov\)](https://www.usgs.gov)



CSO Discharge Data Collection. To measure discharge volumes, Lowell utilizes direct measurement/metering methodologies, in which electronic instruments are installed at all CSO locations. The calculations are automated via Lowell's Supervisory Control and Data Acquisitions (SCADA) system. Lowell's SCADA system provides real-time alerts for discharges which are continuously monitored by a Head Operator, who confirms the overflow prior to initiating public notification. Lowell utilizes HACH WIMS programming, as well as additional reporting technologies, to aid in the creation of reports of recent high flow events.

List of Key Parameters:

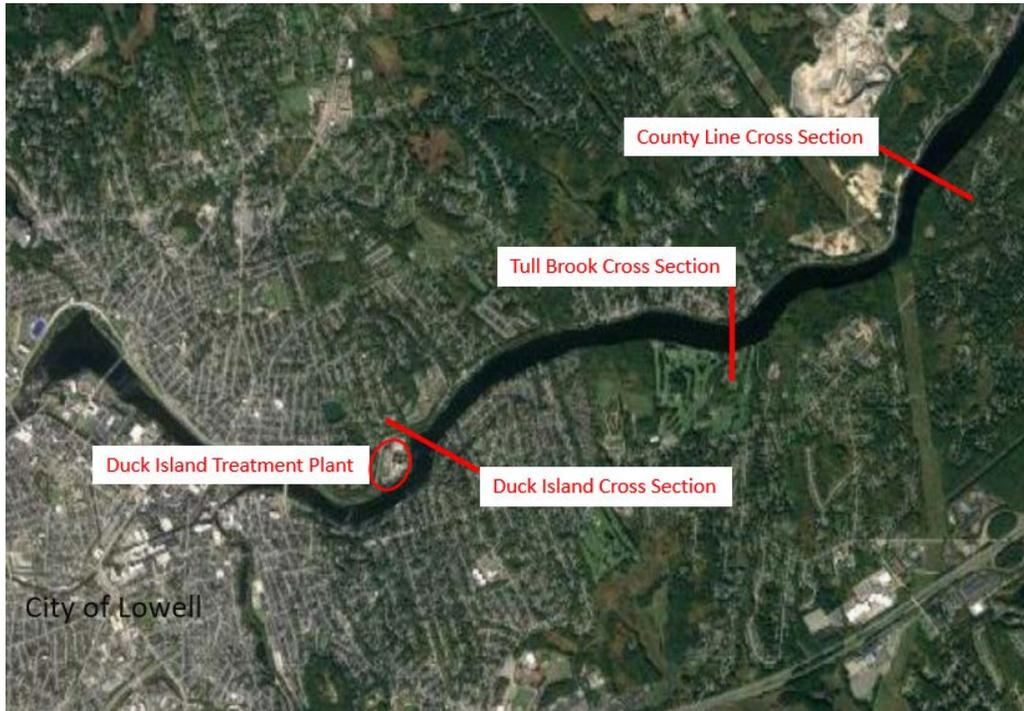
| Parameter | Application |
|------------------------------------------------------------|----------------------------------------------------------------------------------|
| USGS stream gaging data | Instantaneous volume at time of discharge and over time and distance downstream. |
| Tributary drainage area for stream gage | Incremental flow contribution as the release moves downstream |
| Local precipitation data | Correlating event with CSO discharge quantity |
| CSO discharge data | Volume of discharged combined sewage |
| Actual and correlated pathogen concentration data | Determine initial concentrations at discharge |
| Regulatory Limits of <i>E. Coli</i> and <i>Enterococci</i> | Point at which parameters are met determines extent of affected area. |

DETERMINING AFFECTED AREA

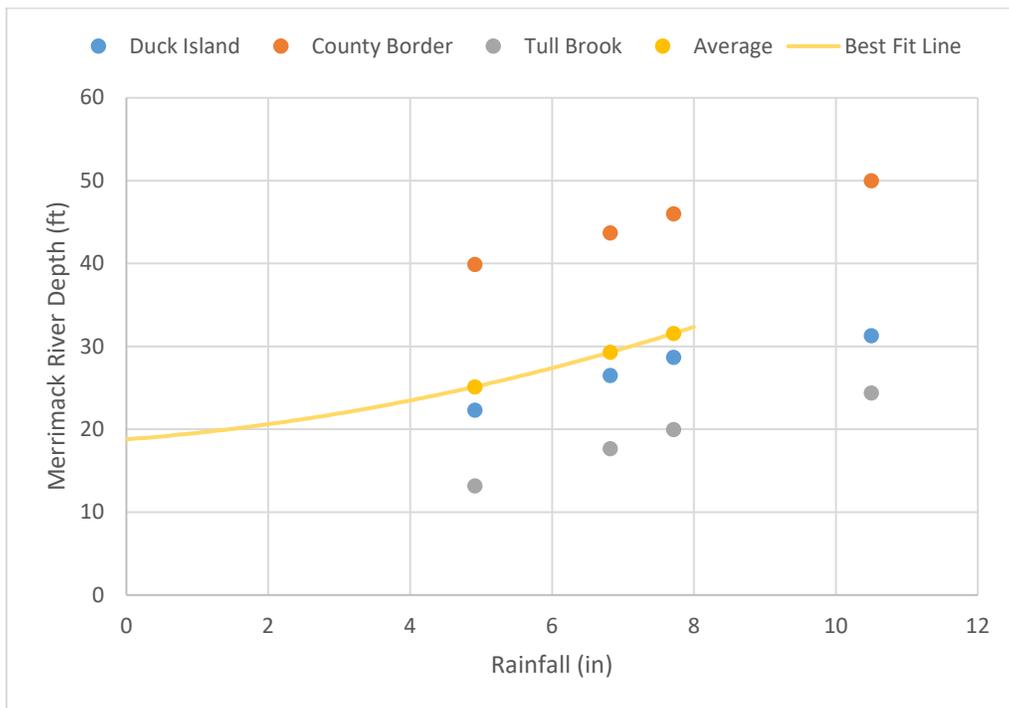
The affected area is determined by an analysis of river flow during wet weather, CSO discharge volumes, and pathogen concentrations. Historical and real time USGS stream gaging data and rainfall data are used to determine the typical river flow conditions during CSO activation to estimate the extent of downstream impact.

Streamflow is determined both upstream and downstream of Lowell from published real-time USGS river gage data. Tributary land area for each USGS stream gage is an additional important factor in the analysis. River flow during the weather event is correlated to the tributary area of the USGS gage to determine contribution of flow per square mile of tributary area (cfs/mi²) during the event. Each square mile of tributary area aggregated between USGS stream gages generates an incremental increase of additional flow; this factor was used to calculate the increase in volume and velocity moving downstream along the river from Lowell to Newburyport (additional cfs/ft of river travelled).

Average river width and depth (700ft and 20ft respectively) were applied to calculate the volume in a theoretical 1-foot-wide cross section of the river. Characteristic river dimensions were determined using the average dimensions of three cross-sections up to 3 miles downstream of the Duck Island Wastewater Treatment Facility. Cross sections were taken from the FEMA Flood Insurance Study for the Merrimack River, with the water surface elevation representing the average depth over the cross-sections during a 1.5-inch storm event. An overview of the cross-section locations used, and their respective interpolated stage curves, are shown in the figures below.



Location of Merrimack River Cross-Sections used for Characteristic Dimensions



Interpolated Merrimack River Stage for Representative Cross-Sections (Source: FEMA Flood Insurance Study for Middlesex County, MA¹)



A dilution factor based on standard methodologies published by EPA² and on the pathogen grab sample concentration data from the CSO is applied both to the cross-section, and as volume increases as it moves in the downstream direction.

Using the USGS discharge data (cfs) applied to this theoretical cross section results in an estimate of average river velocity (fps). River velocity is required to determine the hydraulic retention time from the discharge to travel a given distance: this is important because a pathogen die off rate is applied, which in addition to the incremental increase in flow and resulting dilution, will contribute to further dilution of pathogens in the water. This pathogen die off rate is calculated based on a data report from MWRA³, EPA methodologies⁴ and principles of Chick's and Watson's Law⁵, which is a standard method that describes the deactivation of microbes over time. The point in time the pathogen concentration reaches the Massachusetts State standard can be correlated with a distance downstream of the discharge by factoring the velocity of the river; this distance defines the extent of the affected area.

Affected Area Calculation Tool. An Excel-based tool has been developed that provides a simple means to determine the affected area with minimal input of variables. The tool will be updated on a regular basis as data is collected over time.

To conservatively estimate the affected area of an CSO event, event log data since 2016 was used, and the highest reported CSO volume (86.52 MG) was incorporated into the calculation. Additionally, a conservative concentration estimate for E. Coli was used based on historic (2017-2020) MWRA data for raw sewage (mean E. coli count -134,000 MPN/100mL) and Enterococci concentration (mean Enterococci count - 39,000 MPN/100mL). Flows in the Merrimack River on the day the CSO was reported were obtained from online USGS records (~12000 cfs). A pathogen die-off rate of $0.8d^{-1}$ was used. Using the methodology described in this memorandum, an estimate of the Affected Area due to a CSO release from Lowell regulator(s) extends approximately 12.3 miles, which corresponds to the area of Wingate Avenue in Methuen, MA. The City of Lowell is currently collecting data on pathogen concentrations from its CSOs which will be used in future calculations; data sampled directly from Lowell CSOs will be continuously collected and incorporated into the tool to ensure that the estimate is accurate and up to date.

Bypass Events. While this memorandum focuses on downstream impacts of CSO discharges, the methodology can also be used for determining the downstream impacts of a SSO or a bypass event at the Duck Island facility. To conservatively estimate the affected area of a bypass event at the Duck Island facility, historic E. Coli concentration data from past bypass events since 2020 were used, and the highest reported concentration (2,420 MPN/100mL occurring in January 2021) was used for the calculation. To conservatively estimate Enterococci data, a ratio of 3.5:1 (E. Coli/Enterococci) was applied, resulting in an Enterococci concentration of 691 MPN/100mL. To apply a conservative estimate of bypass flow, total flow from the treatment facility outfall during the reported bypass event was used (21.75 MG) and corresponding flows in the Merrimack River (13,263 cfs) during this event were determined using USGS data and incorporated into the calculations. The resulting affected area from a bypass event is 591 feet. There are no public access points to the Merrimack River within this distance from the Duck Island Treatment facility, and impacts are limited to the City of Lowell.



Sanitary Sewer Overflow (SSO) Events. In general, most SSOs that occur in the City of Lowell tend to be of lower volume and tend to be isolated incidents. To conservatively estimate the affected area of an SSO event, event log data since 2014 was used, and the highest reported estimated volume due to system capacity issues (50,000 gallons) was incorporated into the calculation. Additionally, a conservative concentration estimate for E. Coli was used based on historic (2017-2020) MWRA data for raw sewage (400,000 MPN/100mL, adding the margin of error to be conservative¹) and similarly, a 3.5:1 ratio was applied to determine the associated Enterococci concentration (114,286 MPN/100mL). A pathogen die-off rate of $0.8d^{-1}$ was used. Flows in the Merrimack River on the day the SSO was reported were obtained from online USGS records (1,714 cfs). Using these conservative estimates, the calculated affected area from an SSO event is 222 feet. Based on this information, it is extremely unlikely that an SSO event would cause a discharge that would require notification to any downstream community along the Merrimack River. For high-volume SSOs occurring at outfalls immediately adjacent to neighboring communities, the City of Lowell will utilize the Excel-based tool and the above methodology to confirm whether those communities are impacted and issue a public notification as required per 314 CMR 16.00.

References:

1. *FEMA Flood Insurance Study for Middlesex County, MA*
2. *Tech notes 9 dec 2013 pathogens.pdf (epa.gov)*
3. *MWRA; Task 4: Semiannual CSO Discharge Report No. 6 July 1, 2020 – December 31, 2020; https://www.mwra.com/cso/pcmpa-reports/06_070120-123120.pdf*
4. *2004 EPA CSO SSO Report to Congress: Appendix H Estimation of SSO Impacts in Streams and Rivers*
5. *Chick's law and Watson's law - law for disinfection (brinkart.com)*

¹ Based on, MWRA data for raw sewage, Sample Mean E. coli count -134,000 MPN/100mL, Sample Standard Deviation -115,000 MPN/100mL, z-value for 95% confidence interval – 1.96. The margin of error for 95 % Confidence Interval = z * Standard Deviation. Here, a 95% confidence interval is chosen to estimate the true value in the population with 95% confidence.

Attachment B

In accordance with 314 CMR 16.04 (10) the estimated volume of the discharge or overflow will be determined based on the average discharge or overflow from data reported to the MassDEP and/or EPA for the prior three calendar years. The estimated volume of the discharge for each diversion station is determined by taking the mean discharge volume for each discharge event that occurred in the three previous calendar years.

An example is provided below for Walker Station. From 2020 through 2022 Walker station had 23 CSO diversion events, as shown in table B-1. The volumes of the discharge ranged from 0.02 million gallons (MG) to 9.54 MG, with a total discharge volume of 49.99 MG. The mean volume for the 23 events is 2.17 MG.

Table B-1: Walker Station Diversion Events 2020-2022

| Date | Walker Station CSO Volume (MG) | Date | Walker Station CSO Volume (MG) |
|------------|--------------------------------|------------|--------------------------------|
| 4/19/2022 | 0.02 | 1/25/2020 | 1.07 |
| 7/8/2021 | 0.05 | 10/17/2020 | 1.86 |
| 5/28/2022 | 0.13 | 7/22/2020 | 2.73 |
| 10/17/2022 | 0.21 | 7/12/2021 | 3.24 |
| 7/28/2022 | 0.24 | 11/12/2021 | 3.68 |
| 7/18/2021 | 0.33 | 8/19/2021 | 4.16 |
| 7/30/2021 | 0.35 | 4/29/2021 | 4.22 |
| 10/18/2022 | 0.42 | 9/5/2022 | 5.06 |
| 9/13/2021 | 0.44 | 9/2/2021 | 5.14 |
| 1/17/2022 | 0.54 | 9/10/2020 | 5.31 |
| 9/19/2022 | 0.60 | 7/9/2021 | 9.54 |
| 7/19/2022 | 0.65 | | |

The table below displays Table 1 with additional columns for Active/Inactive and estimated volume. In this example the estimated volumes are calculated as the mean CSO volume for each station for 2020 to 2022. These are the values that will display in notification for the 2023 calendar year. Values will be updated at the beginning of each calendar year.

| Outfall # | Name | Latitude | Longitude | Receiving Water | Active/ Inactive | Estimated Volume (MG) |
|--------------|-------------------|----------|-----------|-----------------|------------------|-----------------------|
| 035 | Lowell Wastewater | 42.64521 | -71.28881 | Merrimack River | Active | 6.64 |
| 002-SDS#1 | Walker Station | 42.64621 | -71.33407 | Merrimack River | Active | 2.17 |
| 007-SDS#2 | Beaver Brook | 42.65933 | -71.31925 | Beaver Brook | Active | 1.16 |
| 008-SDS#3 | West Station | 42.65254 | -71.31032 | Merrimack River | Active | 5.93 |
| 011-SDS#4 | Read Station | 42.64822 | -71.30111 | Merrimack River | Active | 0.03 |
| 012-SDS#5 | First Street | 42.64756 | -71.29086 | Merrimack River | Inactive | N/A |
| 020-SDS#6 | Warren Station | 42.64277 | -71.30502 | Concord River | Active | 3.73 |
| 027-SDS#7 | Tilden Station | 42.65072 | -71.31152 | Merrimack River | Active | 1.02 |
| 030(1)-SDS#8 | Barasford Station | 42.64531 | -71.28841 | Merrimack River | Active | 2.75 |
| 030(2) | Merrimack Station | 42.64518 | -71.28881 | Merrimack River | Active | 3.42 |